CLAIMS

1. Method for hair treatment, wherein

- a composition that contains at least one shape memory polymer P and / or at least one cross-linkable macromer M that forms a shape memory polymer after cross-linking is applied to the hair,

wherein the polymer P and the macromer M are each formed from block polymers having at least a first block which is a polyol selected from polyethers, oligoethers, hydrocarbons having a molecular weight of at least 400 g/mol and at least two alcoholic hydroxyl groups, oligoester diols and polyesters of dicarboxylic acids with diols and at least two additional blocks, which are polyesters of hydroxycarboxylic acids or their lactones,

wherein the macromer M

a) contains cross-linkable regions that are cross-linkable through chemical bonds and

b) thermoplastic regions that are not chemically cross-linkable and

c) the shape memory polymer formed after cross-linking has at least one transition temperature T_{trans};

and wherein the polymer P

a) has at least one hard segment that can be cross-linked by means of physical interaction, said hard segment having a first transition temperature T'_{trans}, which is above room temperature, and

b) has at least one soft segment with a second transition temperature T_{trans} which is lower than T'trans;

- before, simultaneously or subsequently the hair is arranged into a defined shape and

- the shape is subsequently fixed by chemically cross-linking the macromer, while forming a shape memory polymer and / or using physical cross-linking of the polymer P.

2. Method according to Claim 1, characterised in that the macromer M has the formula $A(B\text{-}X)_n$ and the polymer P has the formula $A(B)_n$, wherein A is derived from an n-valent polyether or oligoether, hydrocarbons having a molecular weight of at least 400 g/mol and n alcoholic hydroxyl groups, oligoester diols or from a polyester of a dicarboxylic acid with one diol, B represents a poly(hydroxycarboxylic acid) block and n represents a number greater than or equal to two and X represents a reactive, chemically cross-linkable group.

3. Method according to Claim 2, characterised in that

A is selected from polyalkylene glycol ethers of polyvalent alcohols, poly(tetrahydrofurane), dimerdiol, dimerdiol oligoethers, oligoester diols,

B is selected from poly(ε-caprolactone), poly(pentadecalactone), polylactides, polyglycolides, poly(lactide-co glycolide),

X is selected from ethylenically unsaturated, radically polymerizable groups and

n is 2, 3 or 4.

4. Method according to Claim 1, characterised in that the macromer M has the general formula

$$X1\text{-}0\text{-}[B1\text{-}C\ (=O)O\text{-}]_{n1}[Y\text{-}O]_{n2}[C(=O)\text{-}B2\text{-}O\text{-}]_{n3}X2$$

or the shape memory polymer P has the general formula

$$HO\text{-}[B1\text{-}C(=O)O\text{-}]_{n1}[Y\text{-}O]_{n2}[C(=O)\text{-}B2\text{-}O\text{-}]_{n3}H$$

wherein X1 and X2 are the same or different and represent reactive, chemically cross-linkable groups, B1 and B2 are the same or different and stand for branched, cyclic or linear alkylene groups with 1 to 40 C atoms, Y stands for a branched, cyclic or linear alkylene group with 2 to 30 C atoms or for a polyester block of dicarboxylic acid and diol and n1, n2 and n3 are the same or different numbers greater than zero.

5. Method according to Claim 4, characterised in that X1 and X2 are ethylenically unsaturated, radically polymerizable groups, B1 and B2 stand for branched, cyclic or linear alkylene groups with 2 to 20 C atoms and Y stands for ethylene groups and / or propylene groups.

6. Method according to Claim 5, characterised in that X1 and X2 are acrylate or methacrylate, B1 and B2 stand for branched or linear alkylene groups with 2 to 20 C atoms, Y stands for an ethylene group and where n1, n2 and n3 are selected in such a way that the molecular weight of the macromer or polymer is greater than or equal to 2,000.

7. Method for hair treatment, wherein

- a hairstyle (permanent shape) programmed by a method according to one of the Claims 1 to 6 is heated to a temperature above T_{trans},
- the hair is brought into a second (temporary) shape and
- the second shape is fixed by means of cooling to a temperature below T_{trans}.

8. Method for the recovery of a hairstyle (permanent shape) previously programmed by means of a method according to one of the Claims 1 to 6, wherein a hairstyle in a temporary shape according to Claim 7 or a hairstyle deformed by means of cold forming is heated to a temperature above T_{trans}.

9. Method according to one of the preceding claims, characterised in that the composition additionally contains a macromer with only one chemically reactive group located at a terminal position or a side position.

10. Method according to Claim 9, characterised in that the additional macromer is selected from compounds with the general formula

$$R\text{-}(X')_n\text{-}A3$$

wherein R designates a monovalent organic residue, A3 designates a reactive, chemically cross-linkable group and -(X')n- designates a divalent, thermoplastic polymer or oligomer segment.

11. Method according to Claim 10, characterised in that the additional macromer is selected from polyalkylene glycols substituted with an acrylate group or methacrylate group or from its monoalkyl ethers and block copolymers.

12. Method according to Claim 1, characterised in that at least one shape memory polymer P is used and that the shaping of the hair takes place under heating to a temperature of at least T'_{trans} and that the subsequent fixing of the hair shape takes place by cooling to a temperature below T'_{trans}.

13. Method for hair treatment, wherein

- a hairstyle (permanent shape) programmed by a method according to Claim 12 is heated to a temperature between T'_{trans} and T_{trans},
- the hair is brought into a second (temporary) shape and
- the second shape is fixed by means of cooling to a temperature below T'_{trans}.

14. Method for reprogramming a hairstyle (permanent shape) previously programmed by means of a method according to Claim 12 into a new permanent shape, wherein

- the hairstyle is heated to a temperature above T'_{trans}
- and brought into a new shape and
- the new shape is subsequently fixed by means of cooling to a temperature below T'_{trans}.

15. Method according to one of the Claims 12 to 14, characterised in that the shape memory polymer P has a degree of crystallinity of from 3 to 80% and that the ratio of the moduli of elasticity below and above T_{trans} is at least 20.

16. Cosmetic composition containing, in a suitable cosmetic foundation, at least one active ingredient selected from macromers M according to one of the Claims 1 to 6.

17. Composition according to Claim 16, characterised in that the active ingredient is contained in an amount of from 0.01 to 25 percent by weight.

18. Composition according to one of the Claims 16 to 17, characterised in that from 0.01 to 25 percent by weight of at least one additional active ingredient is contained, said active ingredient being selected from macromers with only one chemically reactive group located at a terminal position or a side position, polymers P according to one of the Claims 1 to 6, hair-care substances, hair-fixing substances and hair-colouring substances.

19. Cosmetic substance containing a composition according to one of the Claims 16 to 18, characterised in that it is present in the form of a lotion, a spray lotion, a cream, a gel, a foam-gel, an aerosol spray, a non-aerosol spray, an aerosol foam, a non-aerosol foam, an o/w or a w/o emulsion, a micro-emulsion or a hair wax.

20. Use of macromers M according to one of the Claims 1 to 6 for hair treatment.